Chapter 6-8: Bacteria

In the Whittaker system of classification, the first kingdom is the Kingdom Monera, which contains the bacteria. This kingdom is also known as Prokaryotae, because all of its members are prokaryotes. Traditionally, the kingdom has included all bacteria, but a contemporary hypothesis separates the ancient bacteria into a domain of their own. These ancient bacteria are considered archaebacteria.

In this plate, we will examine bacteria. These are organisms that have neither organized nuclei, nor cytoplasmic organelles. They reproduce by the simple process of binary fission and do not have any of the structures necessary for mitosis. They also contain only a single chromosome.

Look over the plate appearance that it contains three sections and that shows bacterial types, one that shows bacterial structure, and another that shows bacterial reproduction. Focus your attention on the first section and begin your coloring.

Bacteria are among the oldest living organisms—scientists have found fossils of bacteria that are over 3.5 billion years old. Bacteria are the most common organisms on the Earth, and it has been calculated that the mass of bacteria on our planet outweighs the mass of all other living organisms combined. A single pinch of rich soil, for example, can contain over a billion bacteria.

Despite their immense numbers, bacteria fall into only three general shapes. The first shape is the rod, known as the **bacillus (A)**. Bacilli are used in many ways by humans; including scientific research and the pharmaceutical production of amino acids and vitamins. Bacilli are also directly involved in the cycles of nitrogen, carbon, sulfur, and other minerals on Earth, and some are known to cause human, animal, and plant diseases.

The second major shape is the bacterial sphere known as the coccus. Variations of cocci exist; for example, the **diplococcus (B)** consists of pairs of cocci. Gonorrhea, pneumonia, and a form of meningitis are caused by diplococci. Cocci in a chain form **streptococcus (C)**. Streptococci are used for making yogurt, and certain species cause tooth decay and strep throat. An irregular cluster of cocci is the **staphylococcus (D)**. The "staph" infection is caused by a type of staphylococcus.

The final bacteria type is the **spirochete (E)**. The spirochete is a spiral-shaped organism, one agent of which causes syphilis.

We will now turn our attention to a "typical" bacterial cell, and highlight some of its structures. These structures are intimately associated with bacterial functions. As you read about the structures below, color them in the diagram.

Many bacterial species have the ability to move independently, using a long rotating structure called a **flagellum (F)**. The bacterium in the diagram has two flagella, but some bacterial species have a dozen or more.

Many species of bacteria also possess hairlike structures called pili, also known as **fimbriae (G)**. Many disease-causing bacteria infect animal tissue by attaching to it with their pili. Many bacterial species are surrounded by polysaccharide structures called **capsules (H)**. Capsules provide protection to the bacteria by shielding them against sunlight, chemicals, and other harsh environmental factors.

Almost all bacteria have an intricate **cell wall (I)** that contains the substance peptidoglycan. The cell wall lends rigidity to the bacterium, helping it to retain its shape. Inside the cell wall is the **cell membrane (J)**, which is similar to the cell membrane of eukaryotic cells.

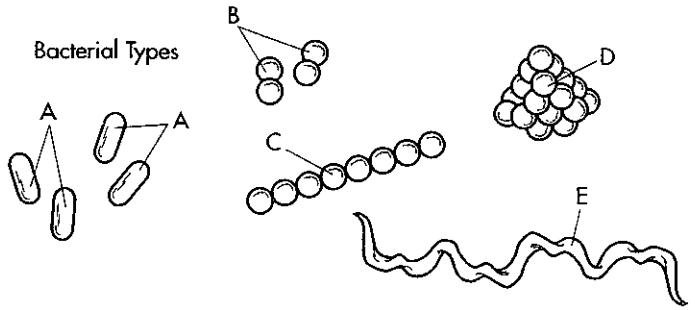
The **cytoplasm (K)** of the bacterium contains proteins, fats, enzymes, carbohydrates, and other materials normally found in cytoplasm. As is the case in eukaryotic cells, bacteria possess **ribosomes (L)**. These ultramicroscopic bodies are the sites of protein synthesis.

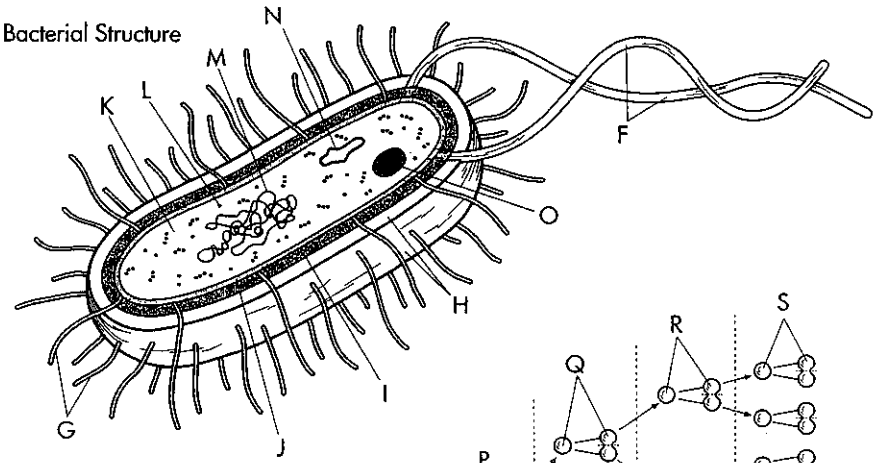
As the diagram illustrates, the bacterium contains a single, closed-loop **chromosome (M)**. The chromosome is in the cytoplasm; there is no nuclear membrane. You can also see a small, closed loop of DNA called a **plasmid (N)**. These plasmids are key in the field of genetic engineering.

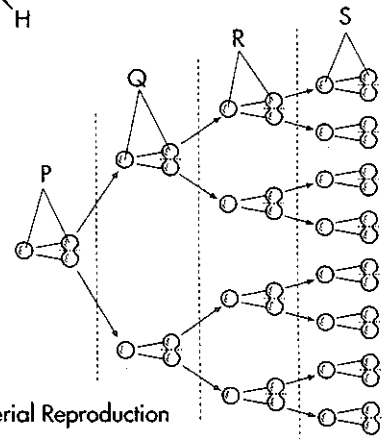
Some bacterial species produce a structure called an **endospore (O)**. These bacteria replicate their DNA and one copy is stored inside this resistant cell, which is able to survive trauma that the bacteria itself is not.

We now turn to a study of bacterial reproduction. The process of bacterial reproduction is called binary fission.

In the diagram we see a single coccus representing the **first generation (P)**. The coccus divides, yielding two cocci in a **second generation (Q)**. Cocci of the second generation metabolize for a period of time, then undergo binary fission to yield a **third generation (R)**. At this point, four cocci have resulted from the initial cocci. These third generation cocci (R) metabolize, and then undergo binary fission to yield the **fourth generation (S)**.







Bacteria
Bacterial Types
- Bacillus.....A
- Diplococcus .....B
- Streptococcus C
- Staphylococcus ....D
- Spirochete .....E

Bacterial Structures
- Flagellum .....F
- Pili (Fimbriae) ....G
- Capsule .....H
- Cell Wall I
- Cell Membrane .....J
- Cytoplasm .....K
- Ribosomes L
- Chromosome.....M
- Plasmid .....N
- Endospore .....O

Bacterial Reproduction
- First Generation....P
- Second Generation ..Q
- Third Generation....R
- Fourth Generation ..S

6-8: Bacteria

a. Kingdom that contains the bacteria:
b. Ancient bacteria are considered:
c. What two things do bacteria not have, that other cells do?
d. How do bacteria reproduce?
e. The oldest bacteria found are this old:
f. Rod shaped bacteria:
g. Sphere shaped bacteria:
h. The prefix diplo means:
i. The prefix strepto means:
j. The prefix staphylo means:
k. Spiral shaped bacteria:
l. Rotating structure found in some bacteria used in movement:
m. Hairlike structures found on bacteria:
n. Polysaccharide structure that surrounds some bacteria for protection:
o. Describe the bacterial chromosome:
p. Small addition loop of DNA found in bacteria which is useful in genetic engineering:
q. Resistant structure in some bacteria in which a copy of DNA is stored: